Nature imagery in advertising
Attention restoration and memory effects

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Environmental psychology postulates that interacting with nature has inherently positive emotional, cognitive and physiological effects. Based on Attention Restoration Theory and related research, this paper presents a theoretical framework hypothesising that nature imagery presented in an advertisement enhances cognitive advertising message elaboration and memory. Three experimental studies, including an eye-tracking experiment, which successively addressed emotional, information processing and memory effects of exposure to nature imagery in advertising, provided evidence supporting postulated effects. Findings confirmed the hypothesis that advertisements featuring visual representations of pleasant nature scenes can evoke very similar emotional responses to those experienced in pleasant natural environments, which constitutes a necessary condition for the suggested cognitive effects. As hypothesised, advertising messages of advertisements featuring pleasant nature imagery achieved higher memory scores in both unaided recall and recognition compared to identical advertisements displaying a variety of other attractive pictures.

Introduction

Memory is still considered a key variable in terms of advertising effectiveness (Delattre & Colovic 2009; Jeong *et al.* 2011; Lee *et al.* 2012). The effect of images on advertising memory has been addressed by a stream of research. Memory for visual advertising stimuli has been found generally superior to memory for verbal messages (Childers & Houston 1984). However, memory for verbal advertising messages seems to be enhanced by emotional reactions to affective advertising imagery (Leigh *et al.* 2006). Environmental psychology may hint at the existence of a not previously addressed perceptual mechanism linking psycho-physiological responses to nature imagery in advertising with enhanced cognitive elaboration and memory of advertising messages. Attention Restoration Theory (ART; Kaplan & Kaplan 1989; Kaplan 1995) and Ulrich's psycho-physiological stress reduction theory (Ulrich 1981, 1983; Ulrich *et al.* 1991) postulate that visual exposure to nature scenery, compared to urban scenes lacking natural elements such as trees, reduces

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stress and enhances cognitive functioning. Contact with nature seems to facilitate the restoration of attention capacities that are depleted by activities demanding prolonged, effortful attention. These findings may also be relevant for advertising research, since pictures of nature presented in an advertisement could potentially induce the suggested effects of exposure to nature, such as favourable influences on cognitive processing and memory, as well as positive emotional effects. The present research analyses in three experimental studies, including an eye-tracking experiment, the behavioural effects of nature imagery in advertising, addressing emotional responses, cognitive message elaboration and memory.

Attention Restoration Theory

For present-day human beings living mostly in urbanised environments, contact with pleasant natural environments seems to lead to a variety of positive psycho-physiological responses (e.g. Ulrich *et al.* 1983; Ulrich 1984; Hartig *et al*. 1991; Korpela *et al.* 2001; Frumkin 2003; Hartig *et al*. 2003; Maller *et al.* 2006; Han 2009). To address some of the beneficial effects of nature, Steven and Rachel Kaplan (Kaplan & Kaplan 1989; Kaplan 1995) have proposed Attention Restoration Theory (ART). ART addresses the empirical observation that contact with nature leads to recovery from mental fatigue – that is, the exhaustion of cognitive mechanism directed attention. According to ART, interacting with nature restores directed attention and improves performance in attention- and memory-related tasks. Directed attention seems to play an important role in subsequent memory of an event (Jonides *et al.* 2008). ART suggests that nature allows directed-attention mechanisms to replenish because interacting with environments rich with inherently fascinating stimuli (e.g. pristine landscapes) captures involuntary attention modestly (Kaplan 1995). Such environments minimise the requirement for directed attention. In contrast, many other environments, such as urban settings, evoke a strong bottom-up stimulation that captures high degrees of attention and additionally require directed attention to overcome that stimulation (e.g. avoiding people and traffic, ignoring advertising), making these environments less restorative. A stream of subsequent empirical research has proved supportive to ART's theoretical framework. Berman *et al.* (2008) carry out two experiments which show that walking in nature or viewing pictures of nature can improve directed attention abilities as measured with a backwards digit-span task and an attention network task. Further evidence supporting ART has been provided using such measures as blood pressure, EKG, Alpha amplitude heart rate, skin conductance, Thayer's mood scales, ZIPERS and PANAS emotion scales, as well as Necker cube and other attention tests (e.g. Hartig *et al.* 1991; Cimprich 1992, 1993; Tennessen & Cimprich 1995; Faber Taylor *et al.* 2002; Cimprich & Ronis 2003; Hartig *et al*. 2003; Berto 2005; Hansmann *et al.* 2007; Depledge *et al.* 2011).

Ulrich's (1981, 1983, 1984, 1986, 1993; Ulrich *et al.* 1991) stress reduction theory is based on a similar approach. According to Ulrich's perspective, exposure to natural environments (including visual exposure to nature on colour slides or video) evokes positive emotional responses and a state of sustained, wakefully relaxed attention. Reduced levels

of negatively toned feelings and reductions in physiological arousal from high to moderate levels lead to a decrease in stress, which in turn improves emotional, physiological and cognitive functioning. A stream of empirical research supports attention restoration from a perspective that combines ART and Ulrich's stress reduction theory. A considerable number of studies have shown that visiting green spaces and being exposed to natural elements reduces psychological strain (e.g. stress, headaches, mental fatigue, feeling unbalanced), increases psychological well-being and supports recovery from illness (Ulrich 1984, 1986, 1993; Verderber 1986; Parsons *et al.* 1998; Frumkin 2001; Kaplan 2001; De Vries *et al.* 2003; Grahn & Stigsdotter 2003; Riediker & Koren 2004; Morita *et al.* 2007). Also, stress reduction may significantly improve memory, since several studies have demonstrated a deleterious effect of stress on memory performance (Deffenbacher *et al.* 1981; Peters 1988, 1997; Kirschbaum *et al.* 1996; Lupien *et al.* 1998; Lupien *et al.* 1999; Newcomer *et al.* 1999; Vedhara *et al.* 2000; Wolf *et al.* 2001; Deffenbacher *et al.* 2004).

Emotional and cognitive effects of nature imagery in advertising

Visual representations of nature are frequently employed in advertising. Not least, the surge in 'green' advertising has led to a significant increase of advertising campaigns featuring pristine and unspoiled natural environments. Advertising can potentially harvest the beneficial behavioural effects of interaction with nature. The theoretical framework and empirical findings related to ART and Ulrich's stress reduction framework, if applied to advertising, suggest that nature imagery in advertising may potentially improve both emotional and cognitive processes involved in advertising effectiveness.

It is generally accepted that positive affective responses to pictures in advertising have a positive effect on attitude towards the advertisement and the brand (e.g. Batra & Ray 1986; Edell & Burke 1987). It has also been previously shown that pictures or video recordings of pleasant nature scenes in advertising can evoke positive emotional responses, which in turn improve attitude towards the brand (Hartmann & Apaolaza-Ibáñez 2008, 2009). Apart from emotional effects, positive cognitive influences of nature imagery on advertising effectiveness could be expected as well. According to ART, exposure to nature improves attention and memory. This may also be the case if individuals are exposed to pictures or video recordings of nature in advertising. A number of studies have addressed the validity of photographs as surrogates for natural environments, suggesting that exposure to photographic pictures of landscapes, plants, animals and water can have similar effects to live interaction with the genuine objects (Shuttleworth 1980; Penning-Rowsell 1981; Coeterier 1983; Nassauer 1982; Zube *et al.* 1987; Bosselmann & Craik 1989; Hull IV & Stewart 1992). It can be hypothesised that emotional responses similar to those evoked by 'genuine' nature scenes can be set off by advertising employing photographs or video recordings of nature.

H1: Advertisements featuring visual representations of pleasant nature scenery evoke emotional responses akin to those experienced in pleasant natural environments.

A confirmation of this hypothesis would imply that beneficial psycho-physiological effects could be expected from exposure to nature imagery in advertising as well. Restoration of recipients' directed attention could lead to improved cognitive advertising message elaboration and memory. Previous advertising research has addressed the effect of exposure to images on memory, however mostly without focusing on specific picture content. Empirical evidence suggests that advertisements including pictures are better remembered than verbal-only advertisements (Shepard 1967; Paivio 1969; Lutz & Lutz 1978; Childers & Houston 1984; Leong *et al.* 1996). Superior memory performance of images may be the consequence of emotional arousal (Kleinsmith & Kaplan 1963; Bradley *et al.* 1992; LaBar & Phelps 1998; Cahill *et al.* 2003; Sharot & Phelps 2004). Arousal as a result of affective advertising has been shown to enhance advertising memory (Leigh *et al.* 2006).

Not surprisingly, attention also seems to play a significant role in advertising memory. Empirical research has shown that arousal provoked by emotional advertising content stimulates involuntary attention and enhances cognitive elaboration (information processing) of the advertisement (Kroeber-Riel 1979; Lang 1990; Christianson *et al.* 1991). Emotional arousal appears to influence memory by improving attention and cognitive elaboration (Kleinsmith & Kaplan 1963; Christianson & Loftus 1991; Reisberg & Heuer 1992). Increased attention has been shown to lead to higher levels of aided (Craik *et al.* 1996; Rajaram *et al.* 2001) as well as unaided recall (Olsen 1995; Rosbergen *et al.* 1997; Till & Baack 2005). Thus, attention constitutes an important component of advertising effectiveness (Walker & Von Gonten 1989). Taking eye-fixations as an indicator for overt attention, it has been shown that emotional picture elements elicited eye movements consistent with attention narrowing (Loftus *et al.* 1987).

Kaplan's Attention Restoration Theory (Kaplan & Kaplan 1989; Kaplan 1995) suggests an alternative perceptual process that under specific conditions may also increase attention and memory, and which may prove relevant for advertising featuring nature imagery. Since directed attention seems to play an important role in memory, contact with nature should improve performance in attention and memory related tasks. In addition, according to Ulrich's stress reduction theory, exposure to nature reduces physiological arousal from high to moderate levels, instilling a state of sustained, wakefully relaxed attention, which improves cognitive elaboration (Ulrich 1981, 1983). It can be hypothesised that pictures or video recordings of nature featured in advertising may, overall, enhance mental elaboration of advertising messages and lead to an increase in memory retention of these messages.

H2: Nature imagery featured in an advertisement leads to an increase in advertising message recall and recognition levels.

The theorised increase in directed attention towards advertising messages as a behavioural response to visual contact with nature scenes represented in the advertisement may be directly involved in enhancing advertising memory. Nature imagery in advertising may lead to an increase in attention towards advertisement messages, which in turn may constitute a significant antecedent of post-exposure message recall and recognition.

H3: Nature imagery featured in an advertisement enhances directed attention towards advertising messages.

Study 1

Method

With the aim of conducting a comparative analysis of emotional responses evoked by advertisements featuring nature scenery and contact with genuine nature (H1), an experimental field study was conducted, based on a single-factor inter-subjects design. To control for the influence of extraneous variables and to guarantee internal validity, participants were assigned randomly to one of eight experimental groups, each exposed during 30 seconds to a different experimental advertisement. Subjects in the control group were not exposed to any advertisement. Advertisements presented a fictitious energy provider and varied only in the content of the picture displayed. Brand name and symbol, as well as advertising copy and formal structure, were kept identical for all advertisements. Six of the advertisements showed pleasant natural landscapes with vegetation: a beech tree on a meadow, Mediterranean coastline, African savannah with trees, a mountain stream, lakes and forests, and an oak forest. The remaining two advertisements featured a vegetation-free rocky desert in the sunlight and a sunny cityscape with classical and modern buildings without any vegetation (see Appendix 1). A total of 536 participants from six cities and towns took part in the experiment. Subjects were selected by random street intercept following quota on sex (50% female, 50% male) and age (20%: 20–25, 25%: 26–35, 30%: 36–50, 20%: 51–65, 5%: >65). The final sample composition was 54% female and 46% male, aged between 20 and 86 years.

Participants rated their emotional responses to the advertisements on five ten-point bipolar scales. After being questioned on several additional items related to brand perceptions, as well as general activities and opinions, subjects rated on identical scales the emotions they experienced in contact with real nature. For this task they were instructed to mentally visualise their past interactions with natural environments; 91 subjects only rated their emotions evoked by nature, without prior exposure to any advertisement.

Emotion measures were derived from the literature on basic and environmental emotions. From the measurement scales in the literature only those emotional items were selected seeming the most appropriate to assess emotions experienced as a consequence of interacting with natural environments, based on the theory and on several qualitative group discussions with undergraduate university students conducted to explore emotions people may experience in nature. Mehrabian and Russell's (1974) pleasure (pleasant–unpleasant) and arousal (relaxed–aroused) dimensions were used since they were specifically developed to assess emotional reactions to different environments. In addition, since people may experience happiness in natural environments, as well as feelings of freedom, the item pairs happy–sad (Holbrook & O'Shaughnessy 1984; Batra & Ray 1986; Edell & Burke 1987) and free–oppressed (Frijda 1969) were selected from scales previously used in the literature. Finally, also the item pair secure–unsecure (Frijda 1969; Allen *et al.* 1992)

was selected, since environmental psychology suggests that individuals may experience degrees of safety or danger, depending on the type of natural environment with which they are interacting (e.g. Appleton 1975).

Results

Table 1 shows for each experimental advertisement mean values of emotion ratings, as well as emotional responses evoked by interaction with nature for the group not exposed to any advertisement. Pairwise comparisons between the experimental advertisement group means and the nature group means were conducted by ANOVA post hoc multiple comparisons Fisher's Least Significant Difference (LSD) test (Table 2). Results indicate

Table 1: Dependent variables mean values

		Dependent variable				
Independent variable		**relaxed–aroused**	**pleasant–unpleasant**	**happy–sad**	**free–oppressed**	**secure–unsecure**
Savannah	Mean	7.59	7.43	6.63	8.15	6.46
	N	54	54	54	54	54
	Std dev.	1.74	1.61	1.64	1.42	2.20
Mountain stream	Mean	8.77	8.82	8.30	8.66	7.38
	N	56	56	56	56	56
	Std dev.	1.18	1.31	1.73	1.30	1.82
Rocky desert	Mean	6.18	4.33	3.22	5.04	3.91
	N	55	55	55	55	55
	Std dev.	2.55	2.57	2.17	2.86	2.31
Beech tree	Mean	8.19	8.21	7.54	8.40	7.07
	N	57	57	57	57	57
	Std dev.	1.51	1.35	1.69	1.44	1.76
Mediterranean	Mean	8.05	8.65	8.11	8.61	7.05
	N	57	57	57	57	57
	Std dev.	1.95	1.34	1.60	1.32	2.13
Lakes and forests	Mean	8.37	8.44	7.89	9.77	7.70
	N	57	57	57	57	57
	Std dev.	1.51	1.63	1.67	7.73	1.61
City	Mean	4.49	5.66	4.79	4.19	5.53
	N	53	53	53	53	53
	Std dev.	2.39	2.34	2.35	2.90	2.22
Oak forest	Mean	8.05	8.02	7.34	8	6.66
	N	56	56	56	56	56
	Std dev.	1.71	1.39	1.86	1.88	2.06
Nature	Mean	7.99	8.16	7.89	8.56	7.22
	N	91	91	91	91	91
	Std dev.	1.68	1.49	1.51	1.80	1.77

Table 2: ANOVA post hoc multiple comparisons Fisher's Least Significant Difference (LSD) test of mean value differences of emotional responses to nature and emotional responses towards experimental advertisements

	relaxed–aroused			pleasant–unpleasant			happy–sad			free–oppressed			secure–unsecure		
Independent variable	Mean diff.	Std error	*p*	Mean diff.	Std error	*p*	Mean diff.	Std error	*p*	Mean diff.	Std error	*p*	Mean diff.	Std error	*p*
Mountain stream	0.78	0.32	0.01	0.66	0.29	0.02	0.41	0.31	0.19	0.10	0.47	0.83	0.16	0.34	0.65
Mediterranean	0.06	0.31	0.84	0.48	0.29	0.09	0.22	0.31	0.49	0.05	0.46	0.91	–0.17	0.34	0.62
Lakes and forests	0.38	0.31	0.23	0.27	0.29	0.34	0.00	0.31	0.99	1.21	0.46	0.01	0.48	0.34	0.16
Beech tree	0.20	0.31	0.52	0.05	0.29	0.87	–0.35	0.31	0.26	–0.16	0.46	0.73	–0.15	0.34	0.66
Mountain lake	0.10	0.32	0.75	–0.02	0.29	0.94	–0.23	0.31	0.46	–0.10	0.47	0.84	0.10	0.34	0.77
Oak forest	0.06	0.32	0.84	–0.15	0.29	0.61	–0.55	0.31	0.08	–0.56	0.47	0.23	–0.56	0.34	0.10
Savannah	–0.40	0.32	0.21	–0.74	0.29	0.01	–1.26	0.32	(*)	–0.41	0.47	0.38	–0.76	0.35	0.03
Rocky desert	–1.81	0.32	(*)	–3.84	0.29	(*)	–4.67	0.31	(*)	–3.52	0.47	(*)	–3.31	0.34	(*)
Urban	–3.50	0.32	(*)	–2.50	0.30	(*)	–3.10	0.32	(*)	–4.37	0.47	(*)	–1.69	0.35	(*)

(*) $p < 0.01$

that nearly all the emotion ratings for advertisements featuring nature with vegetation were not significantly different from emotional responses to real nature as rated by the experimental group not exposed to any advertisement. On the other hand, the emotion ratings of both the advertisements showing urban and desert scenery were significantly different from emotions experienced by the experimental group that rated only real nature ($p < 0.001$).

Overall, these results are in line with predictions of H1. Desert landscapes seem to be experienced as threatening and less pleasant environments, and do not constitute 'pleasant nature scenery' compatible with the proposed theoretical framework. Exceptions to the expected patterns are the savannah advertisement, which rated significantly lower than nature in three emotional dimensions ($p < 0.03$ to $p < 0.01$), and the mountain stream advertisement, which was rated as significantly more pleasant and relaxing ($p = 0.02$ and $p = 0.01$ respectively). Subsequently, overall correlations of emotional responses to experimental advertisements and nature were computed together for all individual ratings of emotional variables within each experimental group exposed to advertisements (Table 3). Results indicate significant positive correlations ($p < 0.001$) for all advertisements excluding the ones featuring the rocky desert and the urban scenery. Whereas for the former advertisement the correlation is non-significant, for the latter it is significantly negative ($p = 0.03$). Additionally, correlations of mean values of emotion ratings were assessed, confirming the former results, with the exception that, due to the reduced number of mean values to compute the correlation coefficients, the correlation of mean ratings of the urban scenery with mean ratings of nature turns out to be, while still nominally negative, non-significant.

Table 3: Overall correlations of emotional responses to nature with emotional responses towards experimental advertisements

	Individual emotion ratings			Mean values emotion ratings		
Landscape type	*N*	Pearson correlation	Sig. (2-tailed)	*N*	Pearson correlation	Sig. (2-tailed)
Oak forest	280	0.51	(*)	5	0.88	0.04
Beech tree	285	0.48	(*)	5	0.93	0.02
Mediterranean coast	285	0.40	(*)	5	0.94	0.01
Savannah	270	0.34	(*)	5	0.89	0.04
Mountain stream	280	0.28	(*)	5	0.87	0.05
Lakes and forests	285	0.19	(*)	5	0.87	0.05
Rocky desert	275	0.08	0.21	5	0.39	0.51
Urban city	265	–0.14	0.03	5	–0.59	0.29

(*) $p < 0.001$

Discussion

The results of study 1 overall confirm the hypothesis that advertisements featuring visual representations of pleasant nature scenes evoke very similar emotional responses compared to those experienced in interaction with pleasant natural environments, whereas advertisements showing desert or urban environments induced significantly different emotional responses. Findings are consistent with predictions by ART. However, while most natural landscape images seemed to resonate with the subjects' notion of nature, not all visual representations of nature are equally appropriate to evoke emotions consistent with internal concepts of pleasant nature. The additional finding that the mountain stream advertisement was perceived as significantly more pleasant and relaxing than real nature indicates that idealised images of nature may possibly induce stronger beneficial effects on behaviour than pictures that merely match subjects' internal notion of pleasant nature scenery. Overall, the results of study 1 support the hypothesis that beneficial emotional effects of nature discussed in the literature on environmental psychology may be harvested to enhance advertising effectiveness. Confirmation of H1 is a necessary prerequisite justifying further propositions concerning nature imagery's effects on cognitive message elaboration and advertising memory.

Study 2

Method

Study 2 addressed the effect of nature imagery on cognitive elaboration of advertising messages and memory. For this purpose, an eye-tracking experiment was conducted, combined with a 48h recall measurement. The sample consisted of 75 final-year undergraduate management students who were briefed that they were going to participate in an experiment to adjust a new piece of research equipment. The age of participants ranged from 23 to 29, 60% female and 40% male. Participants were randomly assigned to three experimental groups with 25 individuals each. During the eye-tracking sessions, subjects were exposed on-screen successively during ten seconds each to three experimental advertisements featuring three fictitious products and brands. The first and second of these advertisements, promoting respectively a suitcase and an internet service provider, did not vary between experimental groups. Only the last advertisement differed between groups. The three versions of this experimental advertisement featured an identical brand, advertising copy and formal structure. The advertisement's copy detailed the benefits of a new online bank account and introduced the fictitious brand 'NetBank'. The text was placed to the right of the picture and was clearly structured with a headline, several well-separated lines of text each explaining one product feature, and the brand name. The different versions of the experimental advertisement varied only in the picture shown: an attractive young couple, the urban scenery picture from study 1 and, also from study 1, the picture showing the mountain stream landscape (Appendix 2). Both the nature and urban scenery pictures were selected directly in line with ART to test the predicted cognitive effects of

nature scenery as compared to urban scenery. In addition, the picture of the young couple was chosen as a sample of a typical attractive and pleasant advertising image. None of the pictures had any relevance for or relationship with the advertised product, brand or product feature claims.

Tobii T60 eye-tracking equipment was employed for this study. Eye movements were unobtrusively monitored and raw eye-tracking data was recorded with the supplied software package. Eye-tracking methodology enables the monitoring, registering and automatic tabulation of eye-fixation data (Krugman *et al.* 1994; Duchowski 2002; Pieters & Wedel 2004; Pieters 2008). To allow for the actual analysis of the eye-tracking data, the experimental advertisements were divided into a picture area and a text area, equal for all three experimental advertisements. For data analysis, visit count (number of visits to each area from outside), fixation count (number of fixations inside an area) and total fixation duration (total time in seconds spent looking at visual elements of an area) were computed out of the raw data by Tobii software and exported to the SPSS statistical software package.

The experiment was carried out on a Friday afternoon. After each eye-tracking session, the respective participant had to sign a non-disclosure agreement to not discuss the contents of the session until the end of the weekend. Approximately 48 hours after the exposure, the advertising memory of each participant was measured by telephone interview. Advertising research commonly differentiates between (non-aided) recall and recognition (aided or triggered recall) measures (e.g. Bagozzi & Silk 1983; Singh & Rothschild 1983; Wells 2000). Both the recall and recognition measures employed in this study were based on the literature on advertising memory (e.g. Zinkhan *et al.* 1986; Singh *et al.* 1988; Krishnan & Chakravarti 1993; Hutchinson *et al.* 1994; Dubow 1995; Leigh *et al*. 2006). For the measurement of unaided recall, subjects were asked to recall the product category, brand name and product feature claims for any of the advertisements shown in the previous session. Participants received a one-point score respectively for recalling the correct product category (bank account), brand name (NetBank) and each of the five product feature claims of the experimental advertisement. Scores could range from zero to seven. Six alternative verbal recognition tests (Shepard & Chang 1967; Singh & Rothschild 1983; Singh *et al.* 1988; Ahn & La Ferle 2008) were used to assess, respectively, product category and brand recognition (aided recall). Participants received a plus one-point score for recognising the correct brand and product, respectively, out of six different alternative brands and product categories read to them by the telephone interviewer, none of which was shown in the other advertisements. If an individual did not choose any option, a zero-point score was given. For each incorrect brand or product, participants received a minus one-point score, respectively. Subsequently, participants were informed about the actual product category. Recognition of product feature claims was assessed by a yes–no test (Singh & Cole 1985) including an 'I don't know' alternative. Twelve different product features of financial products were read successively to each interviewee, who had to state for each claim if it had been advertised in the bank advertisement or not. Scores were plus one for each correctly recognised feature and minus one for each incorrect answer. Given that five advertised and seven not advertised features were read to the participants, scores for this item could range between minus seven and plus five.

Results

Eye tracking

Eye-tracking results revealed observable differences in the analysed variables total fixation duration (TFD), fixation count (FC) and visit count (VC) between the three different experimental advertisements, which overall point to notable differences in cognitive processing (Table 4). Most significant differences were found in the number of fixations in the text area. Participants in the nature treatment group (exposed to the nature imagery advertisement) had significantly more fixations in this area (FC = 26.56) than the city (urban scenery) treatment group (FC = 22.92, p = 0.04) and the group exposed to the young couple advertisement (FC = 23.36, p = 0.07). They also showed a somewhat longer fixation duration in this area (TFD = 7.46) than the city group (TFD = 6.69; p = 0.10) and the couple group (TFD = 7.09; p = 0.44), the latter, however, being non-significant. Both the text area (VC = 1.76) and the picture area (VC = 1.92) of the nature advertisement were also less visited than both areas of the city advertisement (VC = 2.32; p = 0.04 and VC = 2.60; p = 0.02) and the couple ad (VC = 1.84 and VC = 2.16); not significantly, however, in the latter case. A lower visit count together with a higher fixation count indicates that fixations have left and entered a certain area fewer times. The individual has been less distracted by other areas of the advertisement and has paid more attention to the area in question. Overall, subjects of the group exposed to the nature advertisement

Table 4: Dependent variable mean values, ANOVA post hoc multiple comparisons Fisher's Least Significant Difference (LSD) test

Dependent variable	Independent variable	*N*	Mean	Std deviation	*F*	Sig.	Mean difference	Sig.
Total fixation duration – picture area	Nature	25	2.09	1.66	1.97	0.14		
	Couple	25	2.19	1.46			–0.10	0.82
	City	25	2.93	1.77			–0.84	0.07
	Total	75	2.41	1.65				
Total fixation duration – text area	Nature	25	7.46	1.73	1.32	0.27		
	Couple	25	7.09	1.47			0.37	0.44
	City	25	6.69	1.81			0.77	0.10
	Total	75	7.08	1.68				
Fixation count – picture area	Nature	25	7.68	5.09	2.97	0.05		
	Couple	25	8.56	4.68			–0.88	0.55
	City	25	11.12	5.73			–3.44	0.02
	Total	75	9.12	5.32				
Fixation count – text area	Nature	25	26.56	6.84	2.44	0.09		
	Couple	25	23.36	4.86			3.20	0.07
	City	25	22.92	7.14			3.64	0.04
	Total	75	24.28	6.48				

(continued)

Table 4: Dependent variable mean values, ANOVA post hoc multiple comparisons Fisher's Least Significant Difference (LSD) test (continued)

Dependent variable	Independent variable		*N*	Mean	Std deviation	*F*	Sig.	Mean difference	Sig.
Visit count – picture area	Nature		25	1.92	0.70	2.92	0.06		
	Couple		25	2.16	1.07			–0.24	0.40
	City		25	2.60	1.19			–0.68	0.02
		Total	75	2.23	1.03				
Visit count – text area	Nature		25	1.76	0.72	2.53	0.08		
	Couple		25	1.84	1.07			–0.08	0.77
	City		25	2.32	1.03			–0.56	0.04
		Total	75	1.97	0.97				
Recall	Nature		25	1.12	0.88	9.43	$p < 0.01$		
	City		25	0.52	0.51			0.60	$p < 0.01$
	Couple		25	0.36	0.49			0.76	$p < 0.01$
		Total	75	0.67	0.72				
Recognition	Nature		25	3.24	1.61	4.89	0.01		
	City		25	2.00	1.61			1.24	0.01
	Couple		25	2.00	1.63			1.24	0.01
		Total	75	2.41	1.70				
Memory	Nature		25	4.36	2.10	8.00	$p < 0.01$		
	City		25	2.52	1.94			1.84	$p < 0.01$
	Couple		25	2.36	1.85			2.00	$p < 0.01$
		Total	75	3.08	2.14				

seem to focus more on the text and less on the picture than individuals exposed to any of the other two advertisements. They show more fixations in the text area, leave this area fewer times, and spend more time looking at the text. It should be noted that statistical significances are affected by the small sample sizes of 25 individuals for each group. A larger sample size probably would have led to more significant differences in most or all observed eye-tracking variables.

Memory test

The data of the 48h memory measures were analysed by contingency table cross-tabulation and ANOVA. Results of cross-tab analysis showed that the frequency of both unaided recall and recognition of the advertised product were significantly higher in the group exposed to the nature imagery advertisement (Pearson chi-square=11.04, $p < 0.01$ and chi-square=8.04, $p = 0.01$). Also brand recognition was significantly higher at $p = 0.09$. Brand recall was not significantly different, since only one participant out of the 75 recalled the brand name without prompt (Table 5). Subsequently, composed recall and recognition measures were computed adding scores from product, brand and product attribute recognition and recall, respectively. Finally, an overall memory score was also

Table 5: Cross-tab analysis – frequencies of dependent variable values

Dependent variable		Independent variable				Pearson chi-square	Sig.	Phi	Sig.
		Nature	City	Couple	Total				
Product recall	0	5	14	16	35	11.04	$p < 0.01$	0.38	$p < 0.01$
	1	20	11	9	40				
	Total	25	25	25	75				
Brand recall	0	25	24	25	74	2.03	0.36	0.16	0.36
	1	0	1	0	1				
	Total	25	25	25	75				
Product recognition	0	3	12	10	25	8.04	0.01	0.33	0.02
	1	22	13	15	50				
	Total	25	25	25	75				
Brand recognition	0	10	17	16	43	4.68	0.09	0.25	0.09
	1	15	8	9	32				
	Total	25	25	25	75				

computed for each individual, adding up all memory measures. Results of ANOVA post hoc multiple comparison Fisher's Least Significant Difference (LSD) test showed that participants exposed to the nature imagery advertisement achieved significantly higher scores in all three memory measures ($p = 0.01$ to $p < 0.01$) compared to any of the other two experimental groups (Table 4).

Discussion

Eye-tracking results support the hypothesis that nature imagery featured in an advertisement facilitates directed attention towards advertising messages (H3). This conclusion was derived from the observation that, overall and with certain limitations in significance due to the small sample size, subjects exposed to an advertisement showing a picture of nature scenery had more fixations at the text area of the advertisement, left this area fewer times and spent more time looking at it, than individuals exposed to an identical advertisement with a different picture showing either urban scenery or an attractive young couple. Subjects in the experimental group exposed to the nature scenery advertisement seemed to pay more attention to the text-based advertising message and to be less distracted by the picture itself.

Results of the eye-tracking study directly resonate with the memory test scores obtained. Increased directed attention as a behavioural response to visual contact with nature scenes, as postulated by ART and related research, may be directly involved in enhanced memory. It seems that, indeed, increases in attention towards advertising messages as a consequence of exposure to nature imagery featured in the advertisement may constitute a significant antecedent of post-exposure message recall. Participants exposed to the nature imagery advertisement achieved significantly higher scores in all recall and recognition measures, with the exception of unaided brand recall, which was equally

nil across all the experimental groups. A possible explanation for the near total lack of unaided brand recall could be that more than one exposure would be needed before the brand name could possibly be registered appropriately into the participants' long-term memory for a later active retrieval. The fact that the experimental brand name was rather generic may also have been detrimental to memory effects. Findings provide significant support for H2, suggesting that nature imagery presented in an advertisement enhances memory for advertising messages.

Study 3

Method

The aim of study 3 was to replicate the memory effects of nature imagery shown in study 2 with a wider variety of stimuli and a larger sample. A secondary objective was to confirm, with a wider variety of non-nature imagery and some additional nature pictures, the findings of study 1 regarding the potential of advertisements featuring nature scenery to evoke emotional responses similar to emotions experienced in nature. Participants were randomly assigned to one out of six experimental groups, and exposed to an experimental advertisement during 30 seconds. Six experimental advertisements were designed for the study, replicating the design, structure, product feature claims (online banking account) and brand name (NetBank) of study 2. The advertisements differed only in the main picture. Three advertisements featured pleasant natural landscapes: the Mediterranean coastline image and the lakes and forests from study 1, as well as a new picture of a stream in a meadow. The three remaining advertisements showed a modern living room set-up, a hand typing on a phone or calculator key pad, and three somewhat attractive young people in a modern office environment. None of these visual motives was related to the product or product claims. Thus, one-half of the participants was exposed to an advertisement featuring nature imagery, while the other half saw an advertisement with a picture other than nature (Appendix 3).

A convenience sample of 312 friends and family of university students from a last year's market research course was used for the study. The sample composition was 60% female and 40% male, aged 19–25 (43%), 25–40 (31%) and 41–71 (26%). After the exposure to the respective experimental advertisement, participants rated their emotional responses to the advertisement on emotion scales. Subsequently, they were instructed to imagine themselves in some place in nature and to rate the emotions they felt in that place; 48h post-exposure memory was assessed by telephone interview. Since the overall advertisement design, structure, product feature claims and brand name were all as in study 2, the same measurement method and scales for recall and recognition were used. Emotional responses to the advertisement and emotions evoked by nature were rated on two identical item batteries comprising 18 emotional items and five-point unipolar measurement scales, anchored by 'very much' and 'not at all' (Table 9). Following selection criteria employed in study 1, emotion items were extracted from several measurement scales used in the literature (Frijda 1969; Mehrabian & Russell 1974; Russell 1980; Holbrook & O'Shaughnessy

1984; Batra & Ray 1986; Edell & Burke 1987; Watson *et al.* 1988; Allen *et al.* 1992; Richins 1997).

Results

Confirming the findings of study 2, results of cross-tab analysis of the 48h recall measures show that frequencies of both unaided recall (Pearson chi-square = 5.38, $p = 0.02$) and recognition of the advertised product (chi-square = 5.92, $p = 0.05$), as well as brand recognition (chi-square = 7.24, $p = 0.03$) were significantly higher in the group exposed to nature imagery advertisements (Table 6). Brand recall was somewhat, but not significantly, higher, since only a small number of participants recalled the brand name without prompt. As in study 2, ANOVA post hoc multiple comparison Fisher's Least Significant Difference (LSD) test shows that participants exposed to nature imagery advertisements achieved significantly higher scores in composed recall, recognition and overall memory measures ($p = 0.03$ to $p < 0.01$), which were computed adding up, respectively, product, brand and product attribute recognition and recall scores (Table 8). Mean values for each experimental advertisement are depicted in Table 7.

Results of the overall correlation analysis of emotional responses to experimental advertisements and emotions evoked by nature confirmed the findings of study 1. In the nature advertisements group, overall paired sample correlations were highly significant for all emotional items ($p = 0.03$ to $p < 0.001$; $p = 0.06$ for 'bored'), but non-significant in the control group for nearly all items (Table 9).

Table 6: Cross-tab analysis – frequencies of dependent variable values

		Independent variable			Pearson			
Dependent variable		No nature	Nature	Total	chi-square	Sig.	Phi	Sig.
Product recall	0	43	26	69	5.38	0.02	0.13	0.02
	1	113	130	243				
	Total	156	156	312				
Brand recall	0	122	112	234	1.71	0.19	0.07	0.19
	1	34	44	78				
	Total	156	156	312				
Product recognition	–1	14	6	20	5.92	0.05	0.14	0.05
	0	12	6	18				
	1	130	144	274				
	Total	156	156	312				
Brand recognition	–1	28	14	42	7.24	0.03	0.15	0.03
	0	26	20	46				
	1	102	122	224				
	Total	156	156	312				

Table 7: Dependent variable mean values

Dependent variable	Independent variable	*N*	Mean	Std deviation
Memory overall	Hand on phone	52	5.42	3.24
	Stream in meadow	52	6.52	3.41
	Woman in office	52	5.67	3.84
	Mediterranean coast	52	6.79	3.76
	Lakes and woods	52	6.73	3.91
	Living room	52	5.13	3.94
	Total	312	6.04	3.72
Recall	Hand on phone	52	2.69	1.97
	Stream in meadow	52	3.13	2.22
	Woman in office	52	2.58	2.43
	Mediterranean coast	52	3.13	2.12
	Lakes and woods	52	3.12	2.36
	Living room	52	2.50	2.24
	Total	312	2.86	2.23
Recognition	Hand on phone	52	2.73	1.91
	Stream in meadow	52	3.38	1.91
	Woman in office	52	3.10	1.96
	Mediterranean coast	52	3.65	2.08
	Lakes and woods	52	3.62	1.94
	Living room	52	2.63	2.31
	Total	312	3.19	2.05

Table 8: ANOVA analysis of mean value differences between experimental groups

Dependent variable	Independent variable	*N*	Mean	Std deviation	*F*	Sig.
Memory overall	No nature	156	5.41	3.67		
	Nature	156	6.68	3.68	9.31	$p < 0.01$
	Total	312	6.04	3.72		
Recall	No nature	156	2.59	2.21		
	Nature	156	3.13	2.22	4.61	0.03
	Total	312	2.86	2.23		
Recognition	No nature	156	2.82	2.07		
	Nature	156	3.55	1.97	10.24	$p < 0.01$
	Total	312	3.19	2.05		

Discussion

Study 3 confirmed the results of study 2, supporting H2 with a larger sample, and a wider variety of both nature pictures and non-nature visuals. Participants exposed to

Table 9: Paired samples correlations of advertisement emotion scores with nature emotion scores

		Independent variable			
		No nature		Nature	
Dependent variable	*N*	Correlation	Sig.	Correlation	Sig.
Bored	156	0.05	0.55	0.15	0.06
Dull	156	0.09	0.29	0.19	0.02
Peaceful	156	–0.02	0.82	0.17	0.03
Restless	155	0.05	0.51	0.36	$p < 0.001$
Aroused	156	–0.08	0.35	0.30	$p < 0.001$
Excited	156	0.09	0.28	0.31	$p < 0.001$
Active	156	0.16	0.05	0.28	$p < 0.001$
Awake	156	0.04	0.60	0.27	$p < 0.001$
Cheerful	156	0.00	0.98	0.27	$p < 0.001$
Content	156	–0.05	0.57	0.23	$p < 0.001$
Happy	156	0.00	0.99	0.23	$p < 0.001$
Free	156	–0.06	0.45	0.27	$p < 0.001$
Safe	156	–0.05	0.51	0.19	0.02
Depressed	156	0.12	0.15	0.30	$p < 0.001$
Unsecure	156	0.19	0.02	0.37	$p < 0.001$
Oppressed	156	0.08	0.31	0.34	$p < 0.001$

advertisements showing nature imagery achieved significantly higher scores in all 48h recall and recognition measures, with the exception of unaided brand recall, which was very low across all experimental groups. Additionally, the findings of study 1 were confirmed with a wider variety of non-nature imagery and some additional nature pictures. Results provide evidence supporting H1, suggesting that advertisements featuring nature scenery evoke emotional responses similar to emotions experienced in nature.

General discussion and theoretical implications

The aim of this research was to apply a theoretical framework based on Kaplan's (Kaplan & Kaplan 1989; Kaplan 1995) Attention Restoration Theory (ART) and Ulrich's (1981, 1983) stress reduction theory, both stemming from the field of environmental psychology, to the case of advertisements showing pictures of pleasant natural environments. ART and related theory predict that exposure to nature enhances recovery from mental fatigue, restoring mental resources involved in directed attention, and improving performance on attention- and memory-related tasks. In addition, exposure to nature reduces negatively toned feelings and decreases physiological arousal from high to moderate levels, instilling a state of sustained, wakefully relaxed attention, which improves cognitive elaboration (Ulrich 1981, 1983). The present study is the first to apply this theoretical framework to

advertising, proposing that pictures or video recordings of nature featured in advertising may, overall, enhance mental elaboration of advertising messages and lead to an increase in memory retention of these messages.

Three consecutive experimental studies provided evidence supporting the postulated effects. Studies 1 and 3 confirmed the hypothesis that advertisements featuring visual representations of pleasant nature scenes can evoke very similar emotional responses to those experienced in interaction with pleasant natural environments. This finding constitutes a necessary condition for the suggested cognitive effects. The main contribution of this research, however, is to show in studies 2 and 3 that advertising messages of advertisements featuring pleasant nature imagery achieve higher memory scores in both unaided recall and recognition compared to identical advertisements displaying a variety of other attractive pictures. Memory measures did exclusively address verbal product feature claims and the brand name, not recall or recognition of visual elements such as the picture itself. Both the nature and non-nature pictures employed in the experimental study had no relationship with the advertised product. Nature imagery indeed seems to enhance cognitive elaboration and recall, as postulated by ART, even if experienced as an accompanying visual element of an advertisement. Enhanced attention as a psychophysiological reaction to nature imagery, as ART suggests, seems to play a significant role in improving memory. Numerous studies link attention, cognitive elaboration and advertising memory (e.g. Heuer & Reisberg 1990; Christianson & Loftus 1991; Rosbergen *et al*. 1997; Mulligan 1998; Rajaram *et al*. 2001; Till & Baack 2005). Eye-tracking findings of study 2 support the hypothesis that nature imagery featured in an advertisement facilitates directed attention towards advertising messages. Overall fixation patterns showed that subjects exposed to an advertisement showing a picture of nature scenery had more fixations at the text area of the advertisement, left this area fewer times and spent more time looking at it, seemingly paying more attention to the text-based advertising message and being less distracted by the picture itself.

For advertising theory, the present findings may imply the existence of a not previously addressed perceptual mechanism linking psycho-physiological responses to specific advertising imagery and enhanced cognitive elaboration and memory. The identified pattern of emotional and cognitive responses seems to be differentiated from processes postulated by commonly accepted theory, suggesting that increased emotional arousal leads to deeper cognitive message processing and enhanced memory (e.g. Bradley *et al*. 1992; Friestad & Thorson 1993; Lang & Friestad 1993; Cahill *et al.* 1995; Bolls *et al.* 2001; Sharot & Phelps 2004; Leigh *et al*. 2006). Attention Restoration Theory predicts that interacting with natural environments invokes involuntary attention only modestly, improving performance on tasks that depend on directed-attention abilities since the requirement for directed attention is minimised in such environments. Nature imagery in advertising may not attract a considerable amount of directed attention, instead instilling a beneficial perceptual atmosphere without diverting attention from advertising messages and the brand.

Implications for advertisers

The implications of the present findings for advertisers are twofold. Nature imagery as visual advertising stimuli can convey emotions that are very similar to people's emotional responses to contact with actual nature. Thus, the beneficial emotional effects of nature discussed in the literature on environmental psychology may be harvested to enhance advertising effectiveness. Positive affective reactions to natural scenes in advertising can contribute to improving attitude towards the advertisement and the brand, since positive affective responses to advertising imagery generally have a positive effect on attitude towards the advertisement and the brand (e.g. Batra & Ray 1986; Edell & Burke 1987). Emotional experiences evoked by advertising pictures or video recordings of pleasant nature scenes can improve brand attitude (Hartmann & Apaolaza-Ibáñez 2009, 2010).

However, probably more remarkable are the findings of this study relating to cognitive effects, indicating that attention towards advertising messages and, in particular, advertising message recall and recognition, can be enhanced by showing pleasant nature scenery in advertisements. As this research shows in two experimental studies, nature pictures in advertising potentially improve attention towards advertising messages and memory, compared to other rather attractive product-unrelated images. Thus, advertisers in need of conveying verbal information, and who are considering using visual stimuli not particularly related to the advertised product or brand, should consider favouring pictures of pleasant natural landscapes over other visual motives. Specific product or brand-related imagery, however, could lead to higher memory scores than non-product-related nature imagery. As results also show, some nature pictures may be perceived as significantly more pleasant and relaxing than real nature. It should be considered by advertisers that, possibly, visually idealised images of nature may induce stronger beneficial effects on behaviour than pictures merely matching people's internal notions of pleasant nature scenery.

Limitations and future research

This research refers exclusively to verbal advertising messages presented in combination with pictures unrelated to advertised products and brands. Advertisements showing specific product or brand-related pictures have not been addressed and may achieve higher memory scores than advertisements showing product-unrelated nature imagery. Further limitations are consequences of the experimental set-up of the laboratory and field studies. Only a limited set of advertising stimuli could be employed. A replication of the present research with a wider variety of nature and non-nature images would be desirable. Future research should further explore the specific perceptual and neurological mechanisms through which exposure to nature imagery enhances cognitive processing and advertising message retention.

Appendix 1: Study 1 – excerpts from experimental advertisements

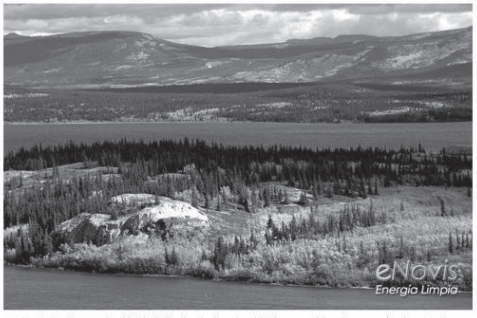
Mountain creek

eNovis energy offers you clean energy from 100% renewable resources. *eNovis* energy is generated entirely from sun, wind, water and biofuels. By purchasing the *eNovis* energy product for a year, a typical household with average monthly usage of 1,000 kWh per month, could avoid contributing over 17,000 pounds of CO2 into our air – as much as your car makes in almost 20,000 miles of driving.

Mediterranean coast

eNovis le ofrece electricidad limpia de fuentes 100% renovables. La energía de *eNovis* se genera enteramente de sol, viento, agua y biomasa. Contratando electricidad *eNovis* durante un año, una vivienda unifamiliar típica con un consumo mensual de 1000 kWh puede evitar la emisión de 8000 kg de CO2 a la atmósfera – la cantidad que un automóvil emite en 23.000 km de conducción.

Lakes and forests



eNovis le ofrece electricidad limpia de fuentes 100% renovables. La energía de *eNovis* se genera enteramente de sol, viento, agua y biomasa. Contratando electricidad *eNovis* durante un año, una vivienda unifamiliar típica con un consumo mensual de 1000 kWh puede evitar la emisión de 8000 kg de CO2 a la atmósfera – la cantidad que un automóvil emite en 23.000 km de conducción.

Savannah

eNovis energy offers you clean energy from 100% renewable resources. *eNovis* energy is generated entirely from sun, wind, water and biofuels. By purchasing the *eNovis* energy product for a year, a typical household with average monthly usage of 1,000 kWh per month, could avoid contributing over 17,000 pounds of CO2 into our air – as much as your car makes in almost 20,000 miles of driving.

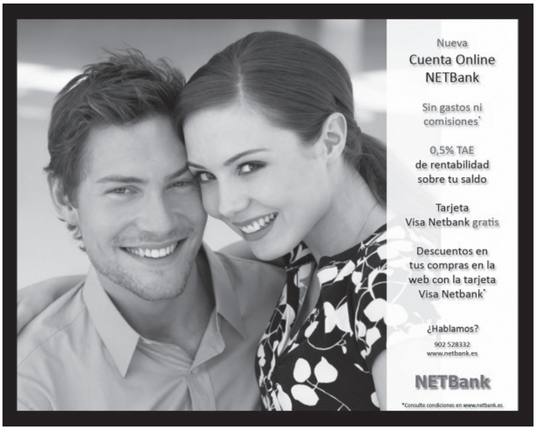
City

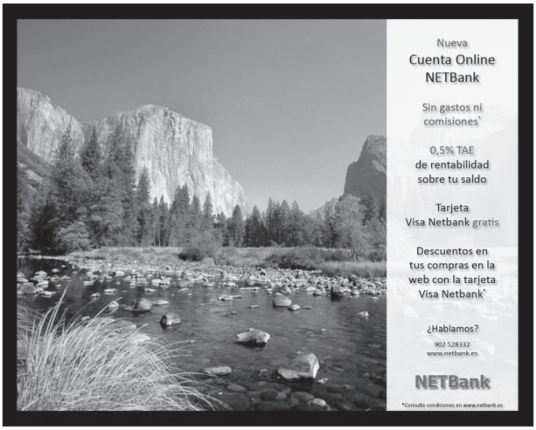
eNovis le ofrece electricidad limpia de fuentes 100% renovables. La energía de *eNovis* se genera enteramente de sol, viento, agua y biomasa. Contratando electricidad *eNovis* durante un año, una vivienda unifamiliar típica con un consumo mensual de 1000 kWh puede evitar la emisión de 8000 kg de CO2 a la atmósfera – la cantidad que un automóvil emite en 23.000 km de conducción.

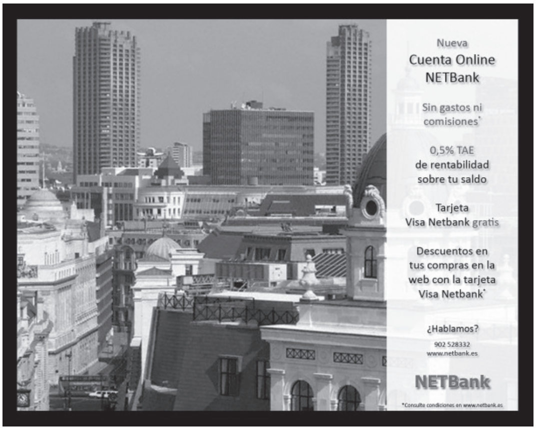
Rocky desert

eNovis le ofrece electricidad limpia de fuentes 100% renovables. La energía de *eNovis* se genera enteramente de sol, viento, agua y biomasa. Contratando electricidad *eNovis* durante un año, una vivienda unifamiliar típica con un consumo mensual de 1000 kWh puede evitar la emisión de 8000 kg de CO2 a la atmósfera – la cantidad que un automóvil emite en 23.000 km de conducción.

Appendix 2: Study 2 – experimental advertisements







Appendix 3: Study 3 – experimental advertisements

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